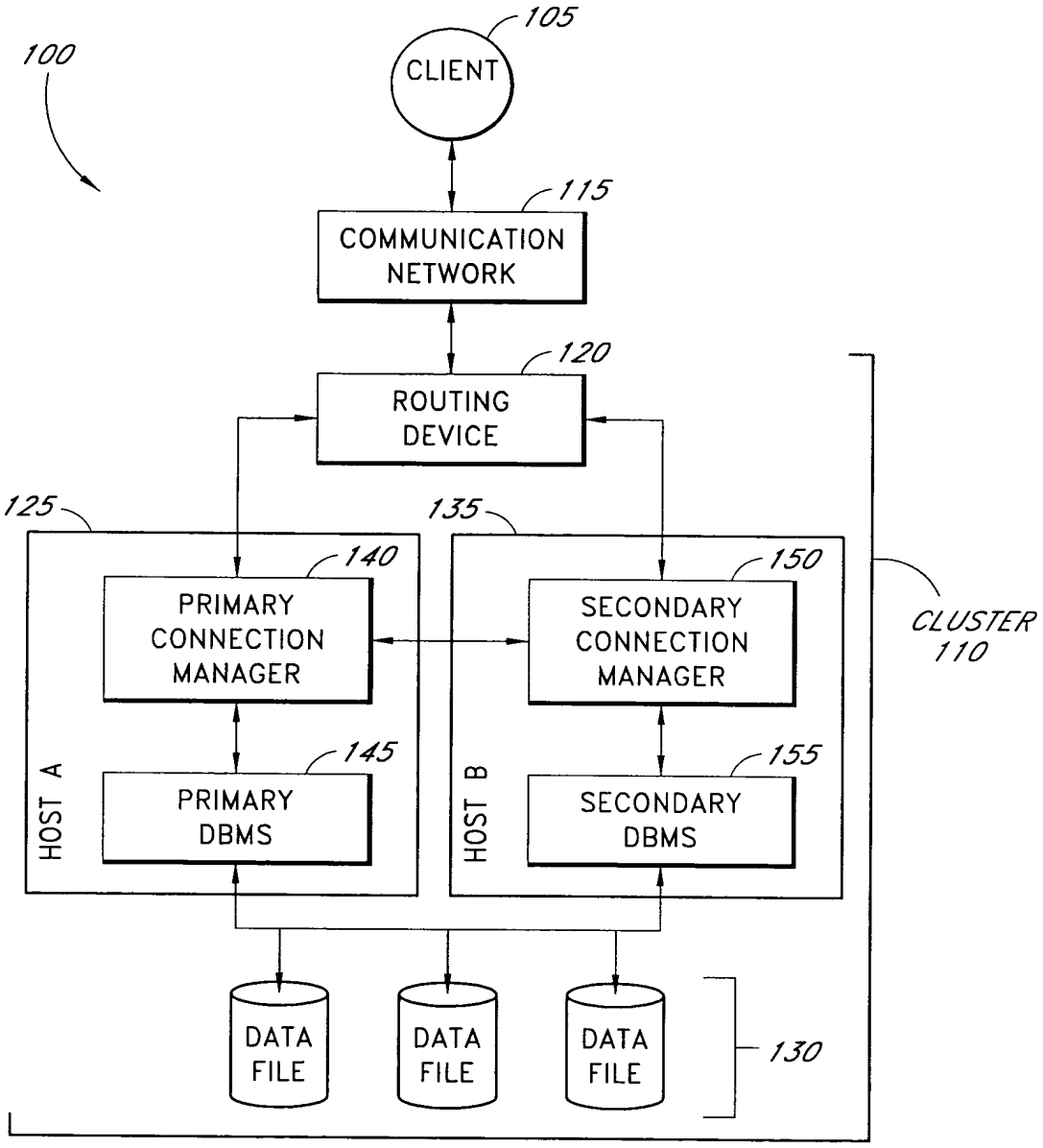
100
105
CLIENT
115
COMMUNICATION NETWORK
120
ROUTING DEVICE
125
135
140
PRIMARY CONNECTION MANAGER
150
SECONDARY CONNECTION MANAGER
CLUSTER 110
145
PRIMARY DBMS
155
SECONDARY DBMS
HOST A
HOST B
DATA FILE
DATA FILE
DATA FILE
130

FIG. 1

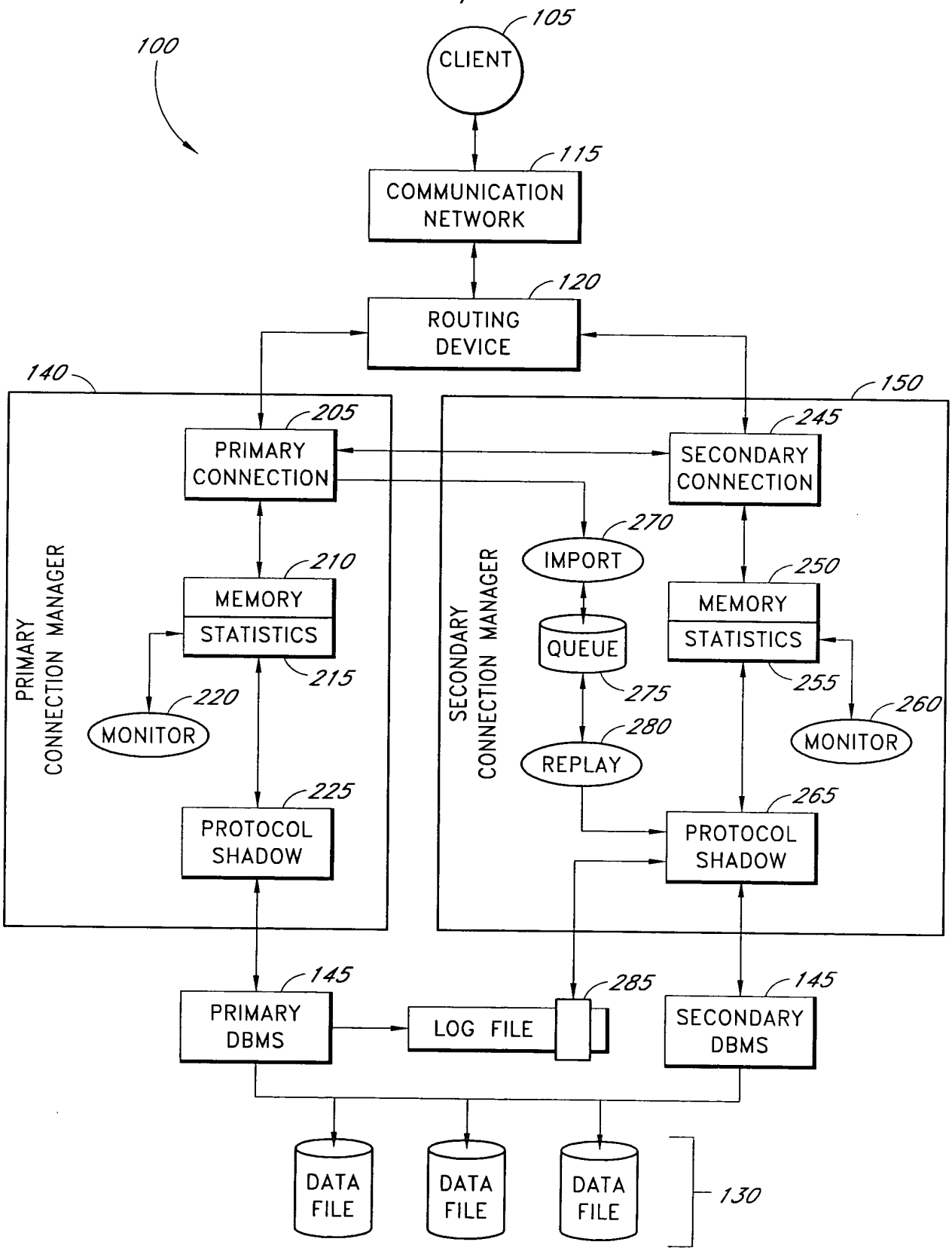
100
105
CLIENT
115
COMMUNICATION NETWORK
120
ROUTING DEVICE
140
150
205
PRIMARY CONNECTION
245
SECONDARY CONNECTION
270
IMPORT
210
MEMORY
STATISTICS
215
250
MEMORY
STATISTICS
255
QUEUE
275
220
MONITOR
280
REPLAY
260
MONITOR
225
PROTOCOL SHADOW
265
PROTOCOL SHADOW
PRIMARY CONNECTION MANAGER
SECONDARY CONNECTION MANAGER
145
PRIMARY DBMS
285
LOG FILE
145
SECONDARY DBMS
DATA FILE
DATA FILE
DATA FILE
130

FIG. 2

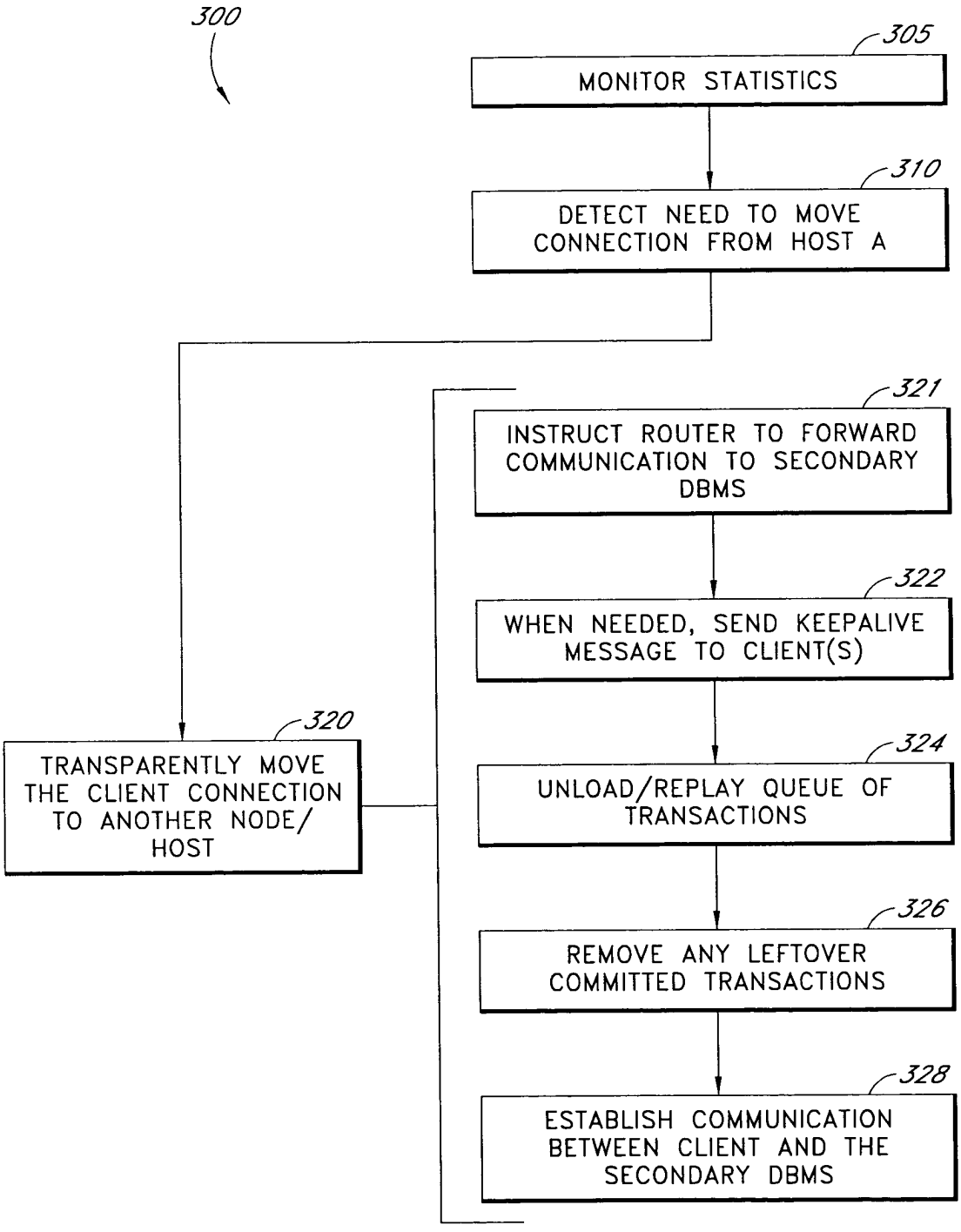
300
305
MONITOR STATISTICS
310
DETECT NEED TO MOVE CONNECTION FROM HOST A
321
INSTRUCT ROUTER TO FORWARD COMMUNICATION TO SECONDARY DBMS
322
WHEN NEEDED, SEND KEEPALIVE MESSAGE TO CLIENT(S)
320
TRANSPARENTLY MOVE THE CLIENT CONNECTION TO ANOTHER NODE/ HOST
324
UNLOAD/REPLAY QUEUE OF TRANSACTIONS
326
REMOVE ANY LEFTOVER COMMITTED TRANSACTIONS
328
ESTABLISH COMMUNICATION BETWEEN CLIENT AND THE SECONDARY DBMS

FIG. 3

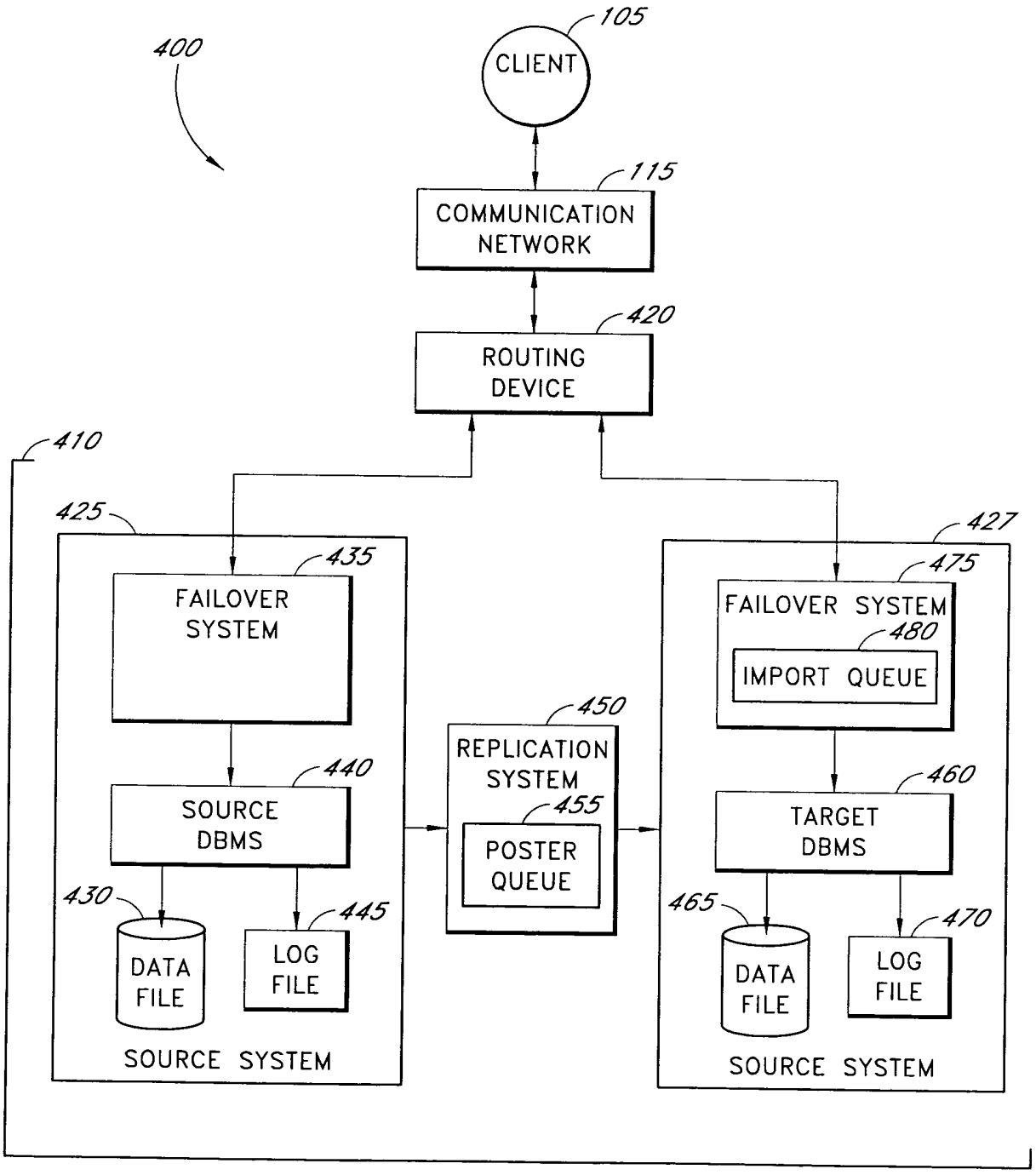
400
105
CLIENT
115
COMMUNICATION NETWORK
420
ROUTING DEVICE
410
425
427
435
FAILOVER SYSTEM
475
FAILOVER SYSTEM
480
IMPORT QUEUE
450
REPLICATION SYSTEM
455
POSTER QUEUE
440
SOURCE DBMS
460
TARGET DBMS
430
445
DATA FILE
LOG FILE
465
470
DATA FILE
LOG FILE
SOURCE SYSTEM
SOURCE SYSTEM

FIG. 4

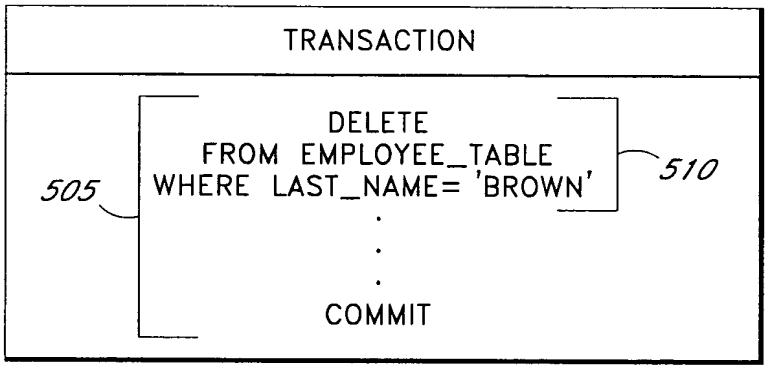
TRANSACTION
DELETE
FROM EMPLOYEE_TABLE
WHERE LAST_NAME= 'BROWN'
505
510
COMMIT

FIG. 5A

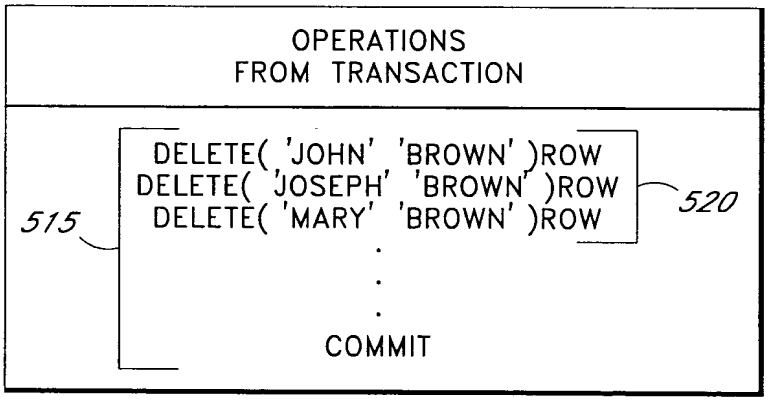
OPERATIONS
FROM TRANSACTION
DELETE('JOHN' 'BROWN')ROW
DELETE('JOSEPH' 'BROWN')ROW
DELETE('MARY' 'BROWN')ROW
515
520
COMMIT

FIG. 5B

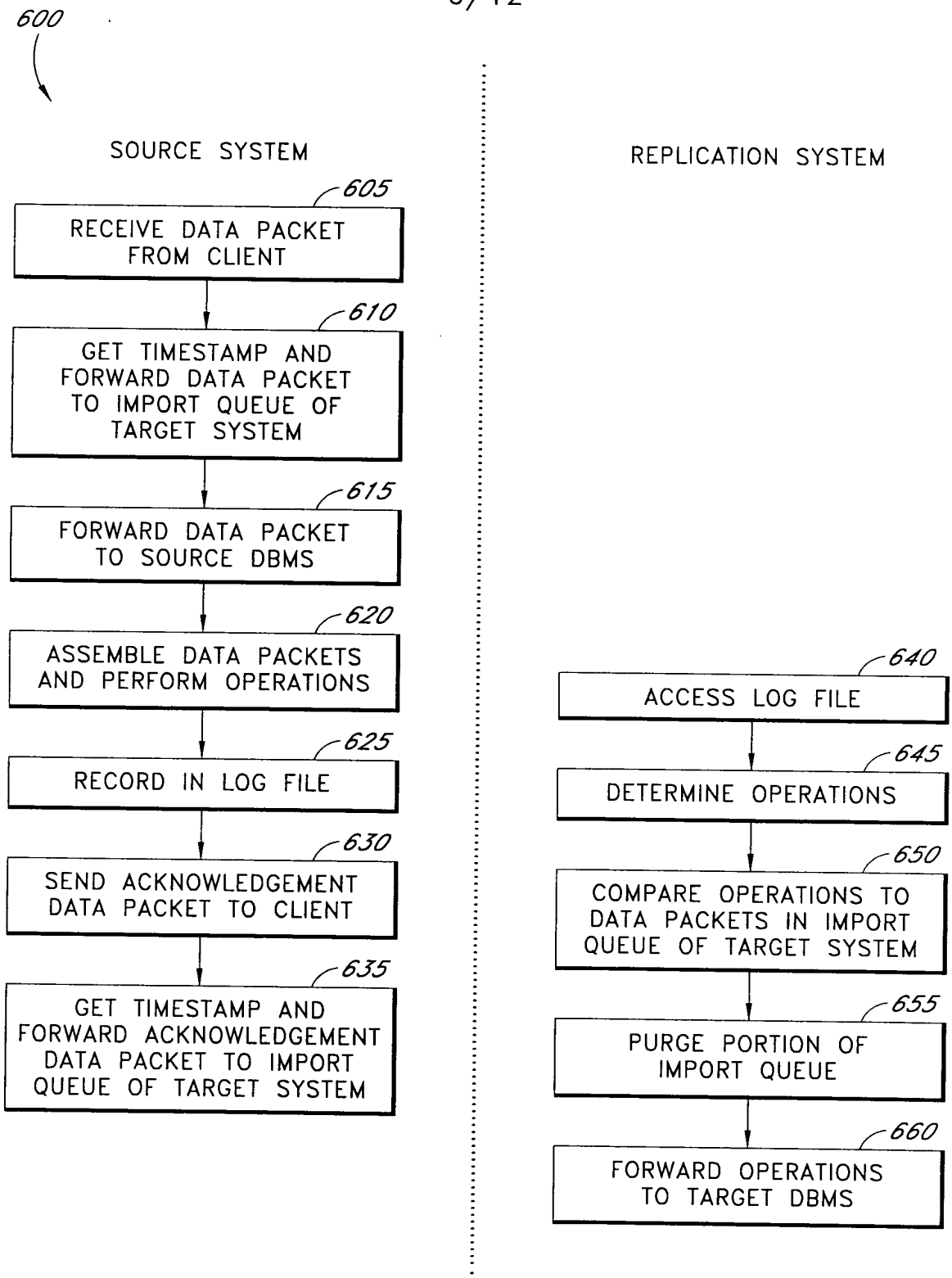
600
SOURCE SYSTEM
REPLICATION SYSTEM
605
RECEIVE DATA PACKET FROM CLIENT
610
GET TIMESTAMP AND FORWARD DATA PACKET TO IMPORT QUEUE OF TARGET SYSTEM
615
FORWARD DATA PACKET TO SOURCE DBMS
620
ASSEMBLE DATA PACKETS AND PERFORM OPERATIONS
625
RECORD IN LOG FILE
630
SEND ACKNOWLEDGEMENT DATA PACKET TO CLIENT
635
GET TIMESTAMP AND FORWARD ACKNOWLEDGEMENT DATA PACKET TO IMPORT QUEUE OF TARGET SYSTEM
640
ACCESS LOG FILE
645
DETERMINE OPERATIONS
650
COMPARE OPERATIONS TO DATA PACKETS IN IMPORT QUEUE OF TARGET SYSTEM
655
PURGE PORTION OF IMPORT QUEUE
660
FORWARD OPERATIONS TO TARGET DBMS

FIG. 6

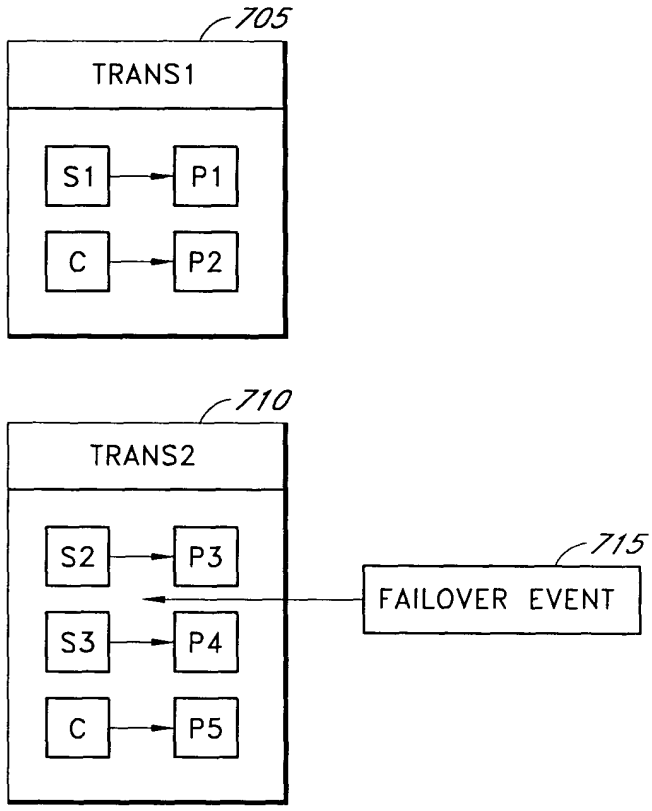
705
TRANS1
S1
P1
C
P2
710
TRANS2
S2
P3
S3
P4
C
P5
715
FAILOVER EVENT

FIG. 7

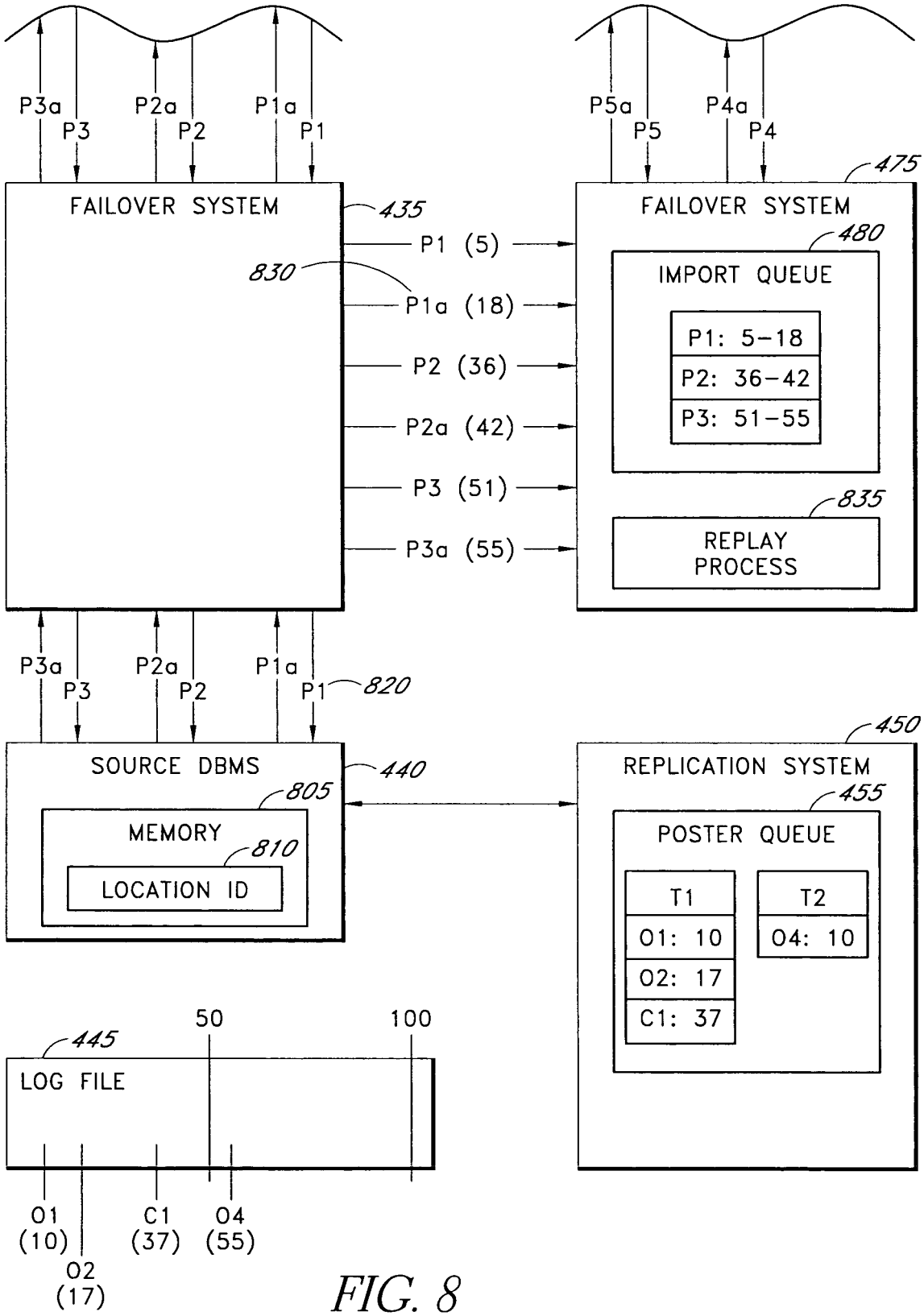
P3a
P3
P2a
P2
P1a
P1
FAILOVER SYSTEM
435
P1 (5)
830
P1a (18)
P2 (36)
P2a (42)
P3 (51)
P3a (55)
P5a
P5
P4a
P4
475
FAILOVER SYSTEM
480
IMPORT QUEUE
P1: 5–18
P2: 36–42
P3: 51–55
835
REPLAY PROCESS
820
SOURCE DBMS
440
805
MEMORY
810
LOCATION ID
450
REPLICATION SYSTEM
455
POSTER QUEUE
T1
O1: 10
O2: 17
C1: 37
T2
O4: 10
445
LOG FILE
50
100
O1 (10)
O2 (17)
C1 (37)
O4 (55)

FIG. 8

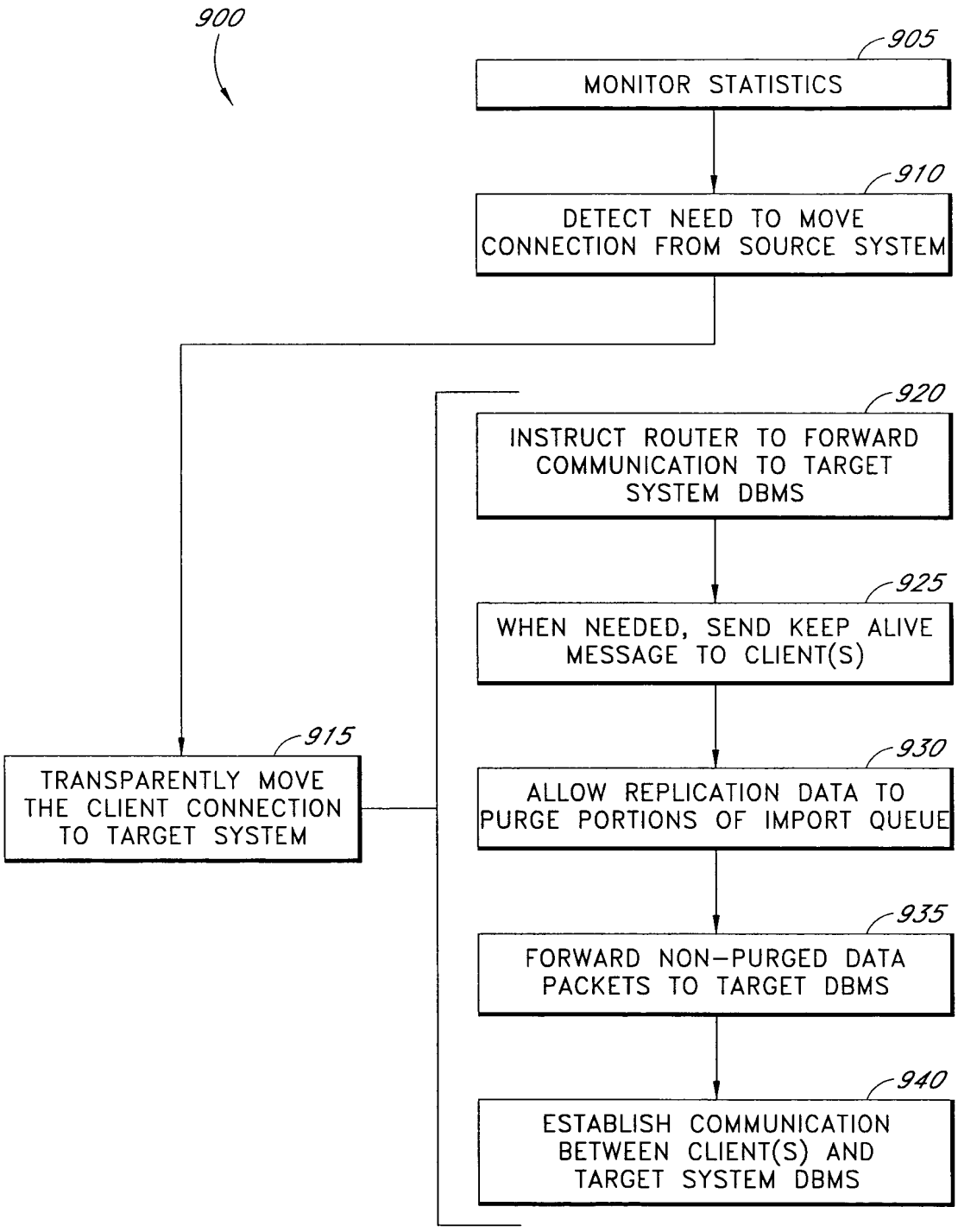
900
905
MONITOR STATISTICS
910
DETECT NEED TO MOVE CONNECTION FROM SOURCE SYSTEM
915
TRANSPARENTLY MOVE THE CLIENT CONNECTION TO TARGET SYSTEM
920
INSTRUCT ROUTER TO FORWARD COMMUNICATION TO TARGET SYSTEM DBMS
925
WHEN NEEDED, SEND KEEP ALIVE MESSAGE TO CLIENT(S)
930
ALLOW REPLICATION DATA TO PURGE PORTIONS OF IMPORT QUEUE
935
FORWARD NON-PURGED DATA PACKETS TO TARGET DBMS
940
ESTABLISH COMMUNICATION BETWEEN CLIENT(S) AND TARGET SYSTEM DBMS

FIG. 9

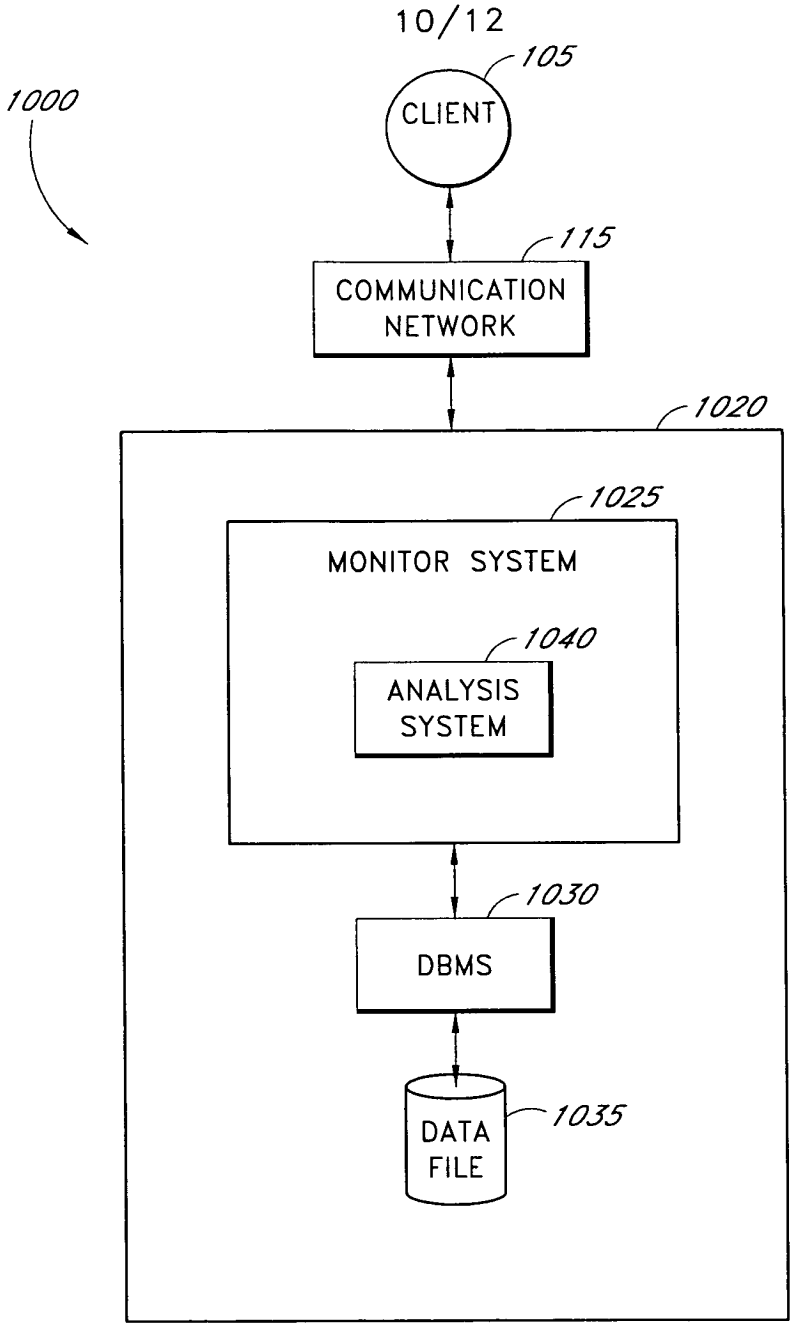
1000
105
CLIENT
115
COMMUNICATION NETWORK
1020
1025
MONITOR SYSTEM
1040
ANALYSIS SYSTEM
1030
DBMS
1035
DATA FILE

FIG. 10

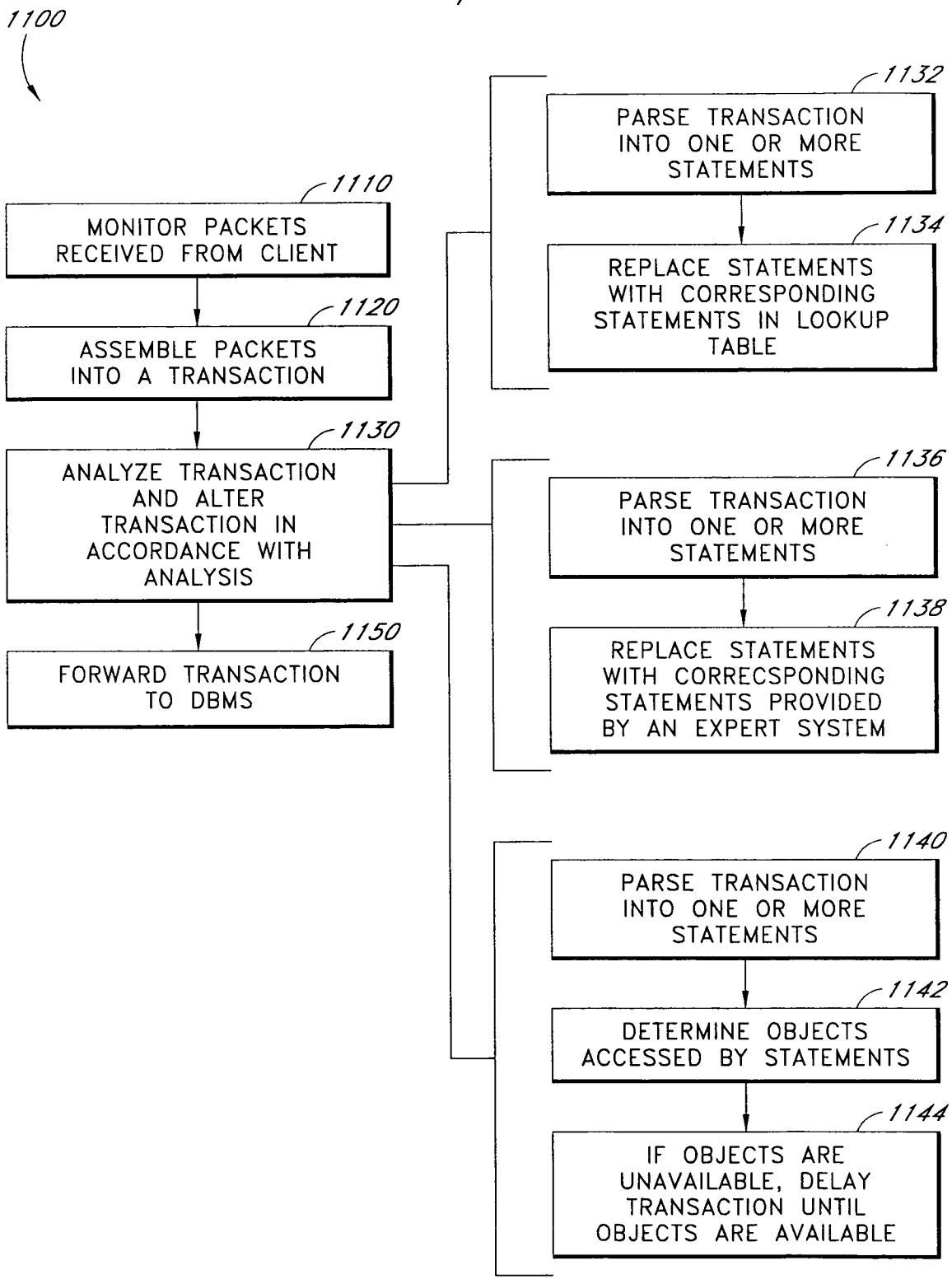
1100
1110
MONITOR PACKETS RECEIVED FROM CLIENT
1120
ASSEMBLE PACKETS INTO A TRANSACTION
1130
ANALYZE TRANSACTION AND ALTER TRANSACTION IN ACCORDANCE WITH ANALYSIS
1150
FORWARD TRANSACTION TO DBMS
1132
PARSE TRANSACTION INTO ONE OR MORE STATEMENTS
1134
REPLACE STATEMENTS WITH CORRESPONDING STATEMENTS IN LOOKUP TABLE
1136
PARSE TRANSACTION INTO ONE OR MORE STATEMENTS
1138
REPLACE STATEMENTS WITH CORRECSPONDING STATEMENTS PROVIDED BY AN EXPERT SYSTEM
1140
PARSE TRANSACTION INTO ONE OR MORE STATEMENTS
1142
DETERMINE OBJECTS ACCESSED BY STATEMENTS
1144
IF OBJECTS ARE UNAVAILABLE, DELAY TRANSACTION UNTIL OBJECTS ARE AVAILABLE

FIG. 11

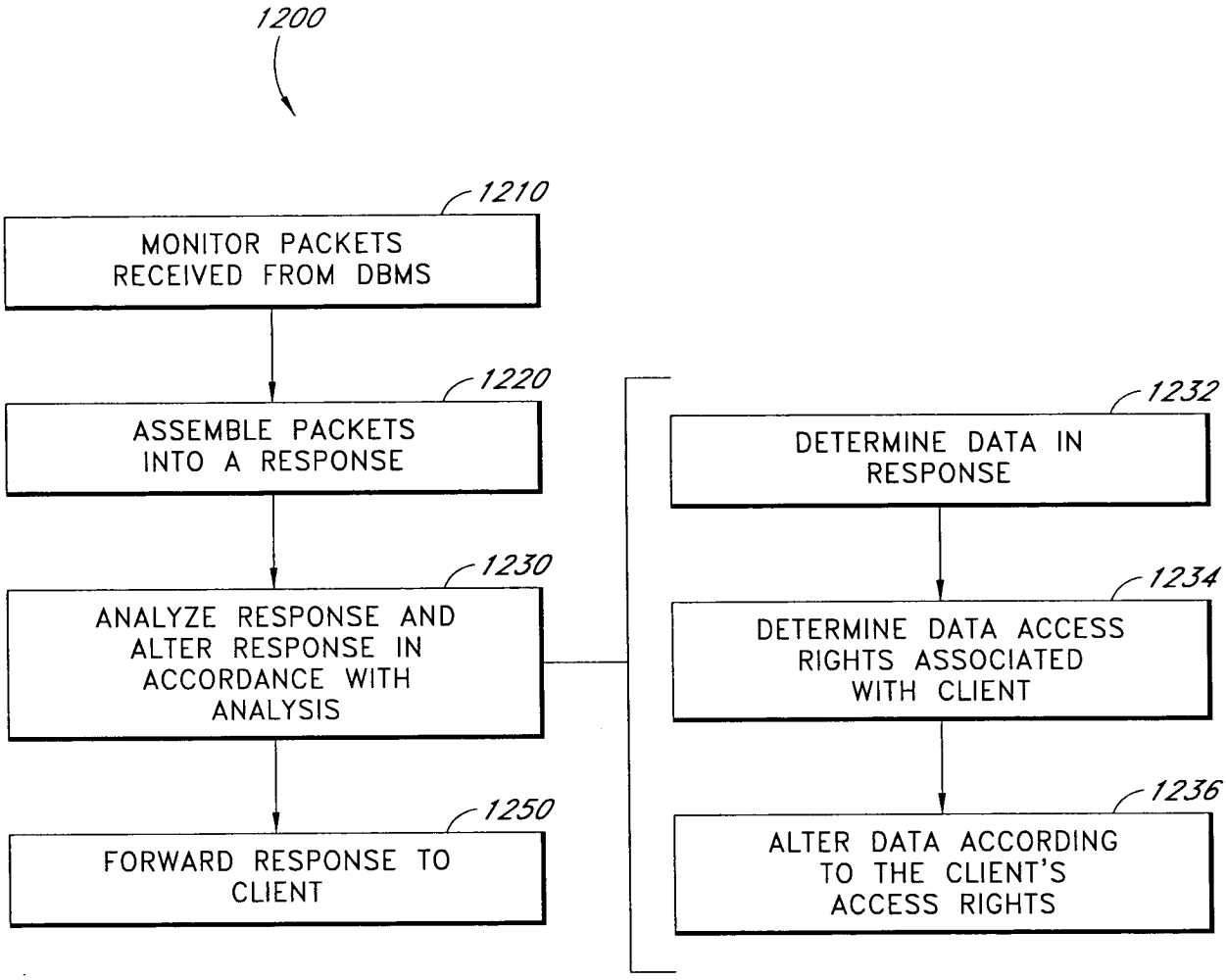
1200
1210
MONITOR PACKETS RECEIVED FROM DBMS
1220
ASSEMBLE PACKETS INTO A RESPONSE
1230
ANALYZE RESPONSE AND ALTER RESPONSE IN ACCORDANCE WITH ANALYSIS
1250
FORWARD RESPONSE TO CLIENT
1232
DETERMINE DATA IN RESPONSE
1234
DETERMINE DATA ACCESS RIGHTS ASSOCIATED WITH CLIENT
1236
ALTER DATA ACCORDING TO THE CLIENT'S ACCESS RIGHTS

FIG. 12